

New Hampshire Volunteer Lake Assessment Program

2003 Biennial Report for Pecker Pond Rindge



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Water Division
Watershed Management Bureau
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OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **PECKER POND, RINDGE**, the program coordinators have made the following observations and recommendations:

We would like to thank your group for sampling your lake/pond once this summer. However, we would like to encourage your monitoring group to sample additional times each summer. Typically we recommend that monitoring groups sample three times per summer (once in June, July, and August). We understand that the number of sampling events you decide to conduct per summer will depend upon volunteer availability, your monitoring group's water monitoring goals and funding availability. However, with a limited amount of data it is difficult to determine accurate and representative water quality trends. Since weather patterns and activity in the watershed can change throughout the summer, from year to year, and even from hour to hour during a rain event, it is a good idea to sample the lake/pond at least once per month over the course of the season.

FIGURE INTERPRETATION

- **Figure 1 and Table 1:** The graphs in Figure 1 (Appendix A) show the historical and current year chlorophyll-a concentration in the water column. Table 1 (Appendix B) lists the maximum, minimum, and mean concentration for each sampling season that the lake/pond has been monitored through the program.

Chlorophyll-a, a pigment naturally found in plants, is an indicator of the algal abundance. Because algae are usually microscopic plants that contain chlorophyll-a, and are naturally found in lake ecosystems, the chlorophyll-a concentration measured in the water gives an estimation of the algal concentration or lake productivity. **The mean (average) summer chlorophyll-a concentration for New Hampshire's lakes and ponds is 7.02 mg/m³.**

The current year data (the top graph) show the chlorophyll-a concentration in July. The chlorophyll-a concentration in July was **less than** the state mean.

The historical data (the bottom graph) show the chlorophyll-a means since 1993.

Overall, visual inspection of the historical data trend line (the bottom graph) shows **variable** in-lake chlorophyll-a trend, meaning that the concentration has **fluctuated** since monitoring began. After 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historic data to objectively determine if there has been a significant change in the annual mean chlorophyll-a concentration since monitoring began.

While algae are naturally present in all lakes/ponds, an excessive or increasing amount of any type is not welcomed. In freshwater lakes/ponds, phosphorus is the nutrient that algae depend upon for growth. Algal concentrations may increase with an increase in nonpoint sources of phosphorus loading from the watershed, or in-lake sources of phosphorus loading (such as phosphorus releases from the sediments). Therefore, it is extremely important for volunteer monitors to continually educate residents about how activities within the watershed can affect phosphorus loading and lake/pond quality.

- **Figure 2 and Table 3:** The graphs in Figure 2 (Appendix A) show historical and current year data for lake/pond transparency. Table 3 (Appendix B) lists the maximum, minimum and mean transparency data for each sampling season that the lake/pond has been monitored through the program.

Volunteer monitors use the Secchi-disk, a 20 cm disk with alternating black and white quadrants, to measure water clarity (how far a person can see into the water). Transparency, a measure of water clarity, can be affected by the amount of algae and sediment from erosion, as well as the natural colors of the water. **The mean (average) summer transparency for New Hampshire's lakes and ponds is 3.7 meters.**

The current year data (the top graph) show that the in-lake transparency in July. The transparency in July was **less than** the state mean.

The historical data (the bottom graph) show that the 2003 mean transparency is **less than** the state mean.

Overall, visual inspection of the historical data trend line (the bottom graph) shows **a stable** trend for in-lake transparency, meaning that the transparency has **remained approximately the same** since monitoring began. After 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historic data to objectively determine if there has been a significant change in the annual mean transparency since monitoring began.

Typically, high intensity rainfall causes erosion of sediments into lakes/ponds and streams, thus decreasing clarity. Efforts should continually be made to stabilize stream banks, lake/pond shorelines, disturbed soils within the watershed, and especially dirt roads located immediately adjacent to the edge of tributaries and the lake/pond. Guides to Best Management Practices designed to reduce, and possibly even eliminate, nonpoint source pollutants, such as sediment loading, are available from DES upon request.

- **Figure 3 and Table 8:** The graphs in Figure 3 (Appendix A) show the amounts of phosphorus in the epilimnion (the upper layer) and the hypolimnion (the lower layer); the inset graphs show current year data. Table 8 (Appendix B) lists the annual maximum, minimum, and median concentration for each deep spot layer and each tributary since the lake/pond has joined the program.

Phosphorus is the limiting nutrient for plant and algae growth in New Hampshire's freshwater lakes and ponds. Too much phosphorus in a lake/pond can lead to increases in plant and algal growth over time. **The median summer total phosphorus concentration in the epilimnion (upper layer) of New Hampshire's lakes and ponds is 11 ug/L. The median summer phosphorus concentration in the hypolimnion (lower layer) is 14 ug/L.**

The current year data for the epilimnion (the top inset graph) show the phosphorus concentration in July. The phosphorus concentration in July was **greater than** the state median.

The historical data show the mean epilimnetic phosphorus concentration since 1993.

The current year data for the hypolimnion (the bottom inset graph) show the phosphorus concentration in July. The phosphorus concentration in July was **greater than** the state median.

The historical data show that the mean hypolimnetic phosphorus concentration since 1993.

Overall, visual inspection of the historical data trend line for the epilimnion and the hypolimnion show a **variable** phosphorus trend, which means that the concentration has **fluctuated** since monitoring began. As you expand your sampling program to include additional sampling events per month, we will be able to determine long-term trends with more accuracy and confidence.

One of the most important approaches to reducing phosphorus loading to a waterbody is to continually educate watershed residents about its sources and how excessive amounts can adversely impact the ecology and value of lakes and ponds. Phosphorus sources within a lake or pond's watershed typically include septic systems, animal waste, lawn fertilizer, road and construction erosion, and natural wetlands.

TABLE INTERPRETATION

➤ **Table 2: Phytoplankton**

Table 2 (Appendix B) lists the current and historic phytoplankton species observed in the lake/pond. The dominant phytoplankton species observed this year were ***Chrysosphaerella*, *Synura* and *Dinobryon*, all golden-brown algae.**

Phytoplankton populations undergo a natural succession during the growing season (Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding seasonal plankton succession). Diatoms and golden-brown algae are typical in New Hampshire's less productive lakes and ponds.

➤ **Table 4: pH**

Table 4 (Appendix B) presents the in-lake and tributary current year and historical pH data.

pH is measured on a logarithmic scale of 0 (acidic) to 14 (basic). pH is important to the survival and reproduction of fish and other aquatic life. A pH below 5.5 severely limits the growth and reproduction of fish. A pH between 6.5 and 7.0 is ideal for fish. The mean pH value for the epilimnion (upper layer) in New Hampshire's lakes and ponds is **6.5**, which indicates that the surface waters in state are slightly acidic. For a more detailed explanation regarding pH, please refer to the "Chemical Monitoring Parameters" section of this report.

The mean pH at the deep spot this season ranged from **6.01** in the hypolimnion to **6.20** in the epilimnion, which means that the water is ***slightly acidic***.

Due to the presence of granite bedrock in the state and the deposition of acid rain, there is not much that can be done to effectively increase lake/pond pH.

➤ **Table 5: Acid Neutralizing Capacity**

Table 5 (Appendix B) presents the current year and historic epilimnetic ANC for each year the lake/pond has been monitored through VLAP.

Buffering capacity or ANC describes the ability of a solution to resist changes in pH by neutralizing the acidic input to the lake. The mean ANC value for New Hampshire's lakes and ponds is **6.7 mg/L**, which indicates that many lakes and ponds in the state are "highly sensitive" to acidic inputs. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

The Acid Neutralizing Capacity (ANC) of the epilimnion (the upper layer) continues to remain below 2.0 mg/L, ***much less than*** the state mean of **6.7 mg/L**. Specifically, the lake/pond is classified by DES as ***acidified***.

➤ **Table 6: Conductivity**

Table 6 (Appendix B) presents the current and historic conductivity values for tributaries and in-lake data. Conductivity is the numerical expression of the ability of water to carry an electric current. The mean conductivity value for New Hampshire's lakes and ponds is **62.1 uMhos/cm**. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

The conductivity in the lake/pond is relatively ***low*** and ***less than*** the state mean. Typically conductivity levels greater than 100 uMhos/cm indicate the influence of human activities on surface water quality. These activities include septic system leachate, agricultural runoff, iron deposits, and road runoff (which contains road salt during the spring snow melt). The low conductivity level in the **lake/pond** is an indication of the low amount of pollutants in the watershed. We hope this trend continues!

➤ **Table 8: Total Phosphorus**

Table 8 (Appendix B) presents the current year and historic total phosphorus data for in-lake and tributary stations. Phosphorus is the nutrient that limits the algae's ability to grow and reproduce. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

➤ **Table 9 and Table 10: Dissolved Oxygen and Temperature Data**

Table 9 (Appendix B) shows the dissolved oxygen/temperature profile(s) for the 2003 sampling season. Table 10 (Appendix B) shows the historical and current year dissolved oxygen concentration in the hypolimnion (lower layer). The presence of dissolved oxygen is vital to fish and amphibians in the water column and also to bottom-dwelling organisms. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

The dissolved oxygen concentration was **high** at all depths sampled at the deep spot of the lake/pond. Typically, shallow lakes and ponds that are not deep enough to stratify into more than one or two layers will have relatively high amounts of oxygen at all depths. This is due to continual lake mixing and diffusion of oxygen into the bottom waters induced by wind and wave action.

➤ **Table 11: Turbidity**

Table 11 (Appendix B) lists the current year and historic data for in-lake and tributary turbidity. Turbidity in the water is caused by suspended matter, such as clay, silt, and algae. Water clarity is strongly influenced by turbidity. Please refer to the "Other Monitoring Parameters" section of this report for a more detailed explanation.

➤ **Table 12: Bacteria (*E.coli*)**

Table 12 lists the current year data for bacteria (*E.coli*) testing. *E. coli* is a normal bacterium found in the large intestine of humans and other warm-blooded animals. *E.coli* is used as an indicator organism because it is easily cultured and its presence in the water, in defined amounts, indicates that sewage **MAY** be present. If sewage is present in the water, potentially harmful disease-causing organisms may also be present. Please consult the "Other Monitoring Parameters" section of the report for the current state standards for *E. coli* in surface waters. If residents are concerned about sources of bacteria such as failing septic systems, animal waste, or waterfowl waste, it is best to conduct *E. coli* testing when the water table is high, when beach use is heavy, or after rain events.

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The *E.coli* concentration was **low** at each of the sites tested this season. We hope this trend continues!

USEFUL RESOURCES

Acid Deposition Impacting New Hampshire's Ecosystems, ARD-32, NHDES Fact Sheet, (603) 271-3505, or www.des.state.nh.us/factsheets/ard/ard-32.htm.

Aquarium Plants and Animals: Don't leave them stranded. Informational pamphlet sponsored by NH Fish and Game, Aquaculture Education and Research Center, and NHDES (603) 271-3505.

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, NHDES-WD 97-8, NHDES Booklet, (603) 271-3503.

A Boater's Guide to Cleaner Water, NHDES pamphlet, (603) 271-3503.

Camp Road Maintenance Manual: A Guide for Landowners. Kennebec Soil and Water Conservation District, 1992, (207) 287-3901.

Comprehensive Shoreland Protection Act, RSA 483-B, WD-SP-5, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/sp/sp-5.htm.

Cyanobacteria in New Hampshire Waters Potential Dangers of Blue-Green Algae Blooms, NHDES Fact Sheet, (603) 271-3505, or www.des.state.nh.us/factsheets/wmb/wmb-10.htm.

Erosion Control for Construction in the Protected Shoreland Buffer Zone, WD-SP-1, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/sp/sp-1.htm

Impacts of Development Upon Stormwater Runoff, WD-WQE-7, NHDES Fact Sheet, (603) 271-3503, or www.des.state.nh.us/factsheets/wqe/wqe-7.htm

Iron Bacteria in Surface Water, WD-BB-18, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/bb/bb-18.htm

Is it Safe to Eat the Fish We Catch? Mercury and Other Pollutants in Fish, NH Department of Health and Human Services pamphlet, 1-800-852-3345, ext. 4664.

Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, WD-BB-9, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/bb/bb-9.htm.

Management of Canada Geese in Suburban Areas: A Guide to the Basics, Draft Report, NJ Department of Environmental Protection Division of Watershed Management, March 2001, www.state.nj.us/dep/watershedmgt/DOCS/BMP_DOCS/Goosedraft.pdf.

Proper Lawn Care In the Protected Shoreland, The Comprehensive Shoreland Protection Act, WD-SP-2, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/sp/sp-2.htm.

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Road Salt and Water Quality, WD-WMB-4, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/wmb/wmb-4.htm.

Sand Dumping - Beach Construction, WD-BB-15, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/bb/bb-15.htm.

Swimmers Itch, WD-BB-2, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/bb/bb-2.htm.

Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988, (608) 233-2836 or www.nalms.org.

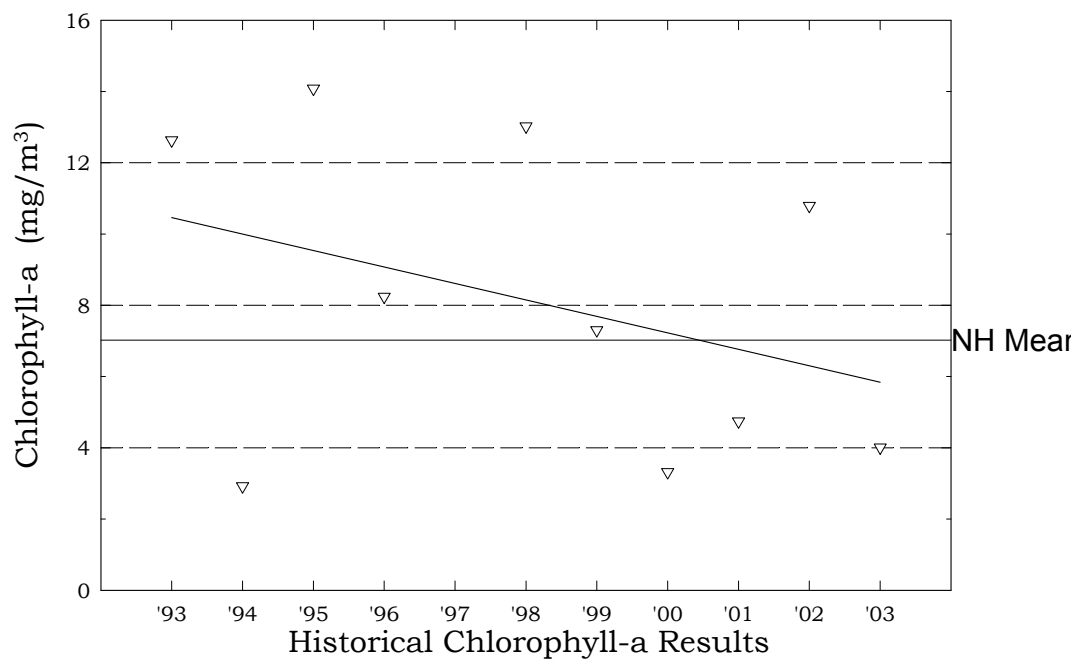
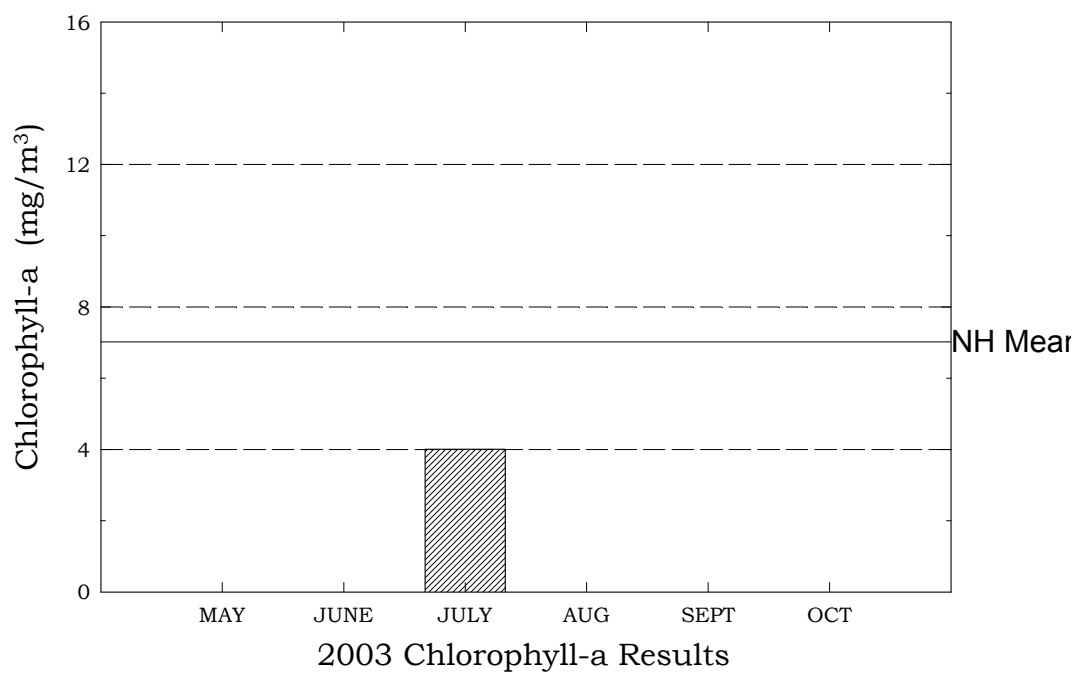
Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/bb/bb-4.htm.

APPENDIX A

GRAPHS

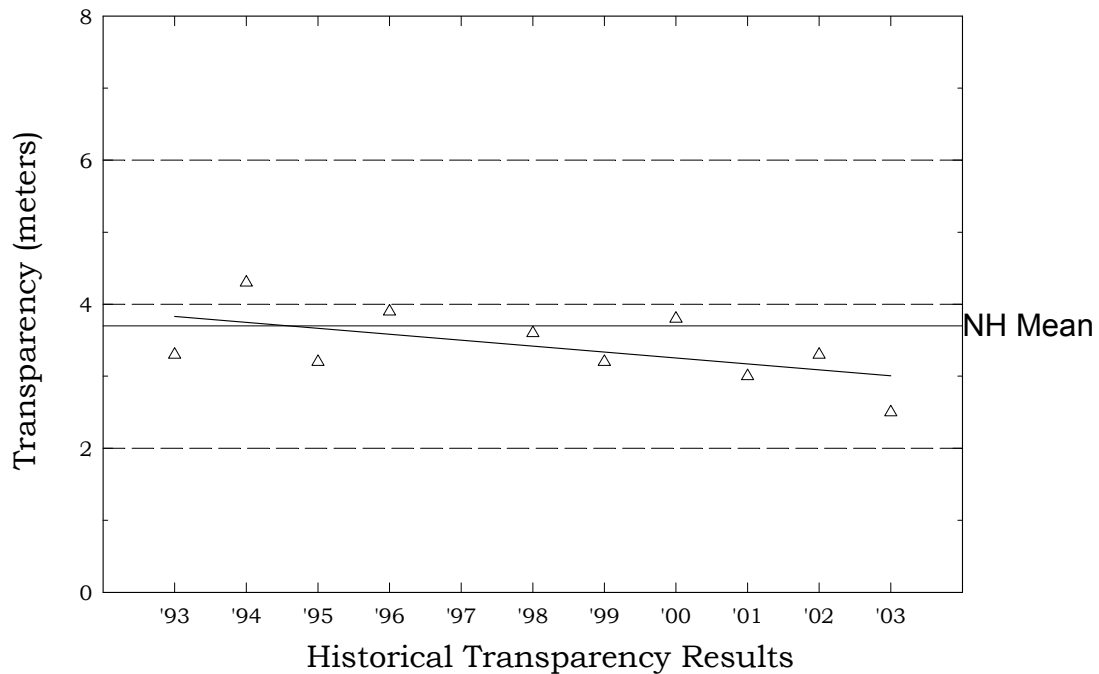
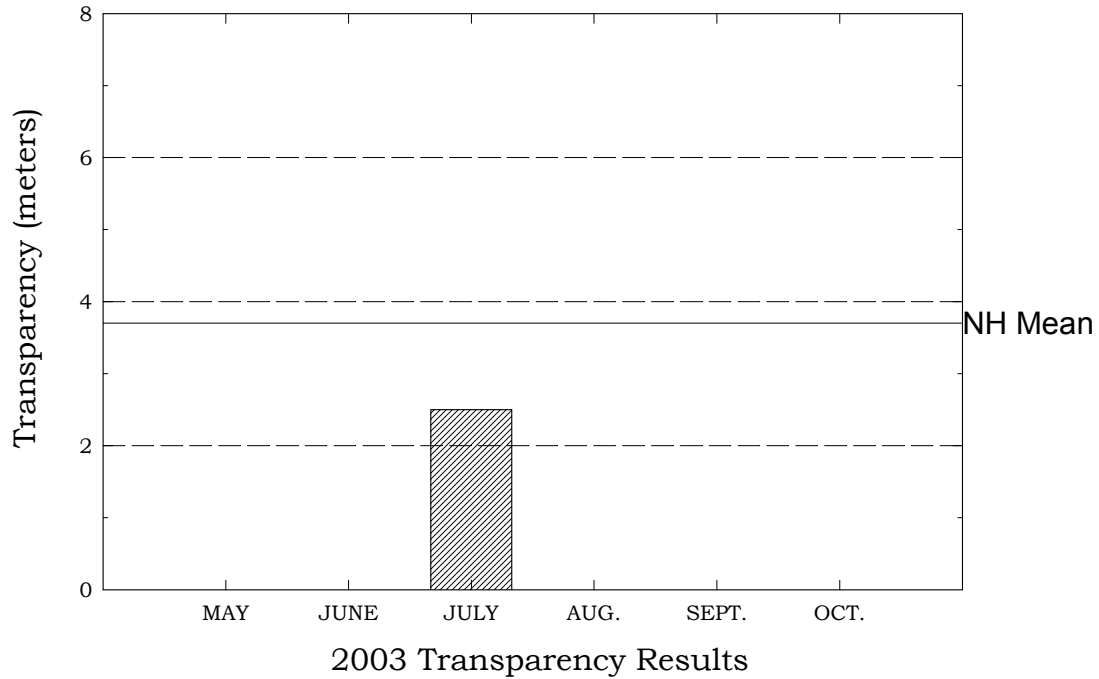
Pecker Pond, Rindge

Figure 1. Monthly and Historical Chlorophyll-a Results



Pecker Pond, Rindge

Figure 2. Monthly and Historical Transparency Results



Pecker Pond, Rindge

Figure 3. Monthly and Historical Total Phosphorus Data.

